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MILK-QUALITY IMPROVEMENT PROGRAM FOR 4-H DAIRY CLUBS

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CONTENTS

	Page		Page
Importance of quality in milk-----	1	Meetings and subjects discussed—	
Object of the program-----	2	Continued.	
Procedure-----	2	Seventh meeting: Treating dairy	
Meetings and subjects discussed-----	3	utensils to kill bacteria-----	12
First meeting: Organization of		Eighth meeting: Clean, healthy	
the club-----	3	cows and milkers, and dry-	
Second meeting: Bacteria in		hand milking-----	13
milk-----	3	Ninth meeting: Small-top pails	
Third meeting: Tests to deter-		and open-top pails-----	14
mine quality of milk-----	6	Tenth meeting: General sanita-	
Fourth meeting: Flavors and		tion and score cards-----	14
odors-----	10	Eleventh meeting: Milk contest	19
Fifth meeting: Cooling and		Twelfth meeting: Field day-----	19
storing milk-----	10	References-----	19
Sixth meeting: Cleaning dairy			
utensils-----	11		

IMPORTANCE OF QUALITY IN MILK

The wider application of methods that will improve the quality of milk and cream produced in this country is of great importance. Dairymen could add millions of dollars to their annual receipts from the sale of dairy products if they would produce milk and cream of only the finest quality. Poor-quality milk means a direct loss to the producer in every instance.

In many sections of the country dairy farmers are not getting market-milk prices for their milk because it does not meet the requirements for market milk and is therefore denied admittance to the cities by the health authorities. The quality of a manufactured dairy product depends on the quality of the raw milk from which it is made. The producer of poor-quality milk, therefore, not only fails to receive fluid-milk prices but also receives a price based on manufactured products of poor quality.

There are many instances of producers receiving a premium of 5 to 70 cents a hundred pounds for milk of high quality. In other instances, the price is reduced by 15 to 25 cents a hundred pounds for poor-quality milk. Even if the direct returns to the producer are no more for high-quality milk and cream than for poor-quality milk and cream, the effect of producing high-quality milk and cream will eventually be reflected in his income because high quality in milk

and cream tends to increase their consumption and to extend the market for dairy products.

Milk and its products are inseparably linked to the welfare of the Nation and to the normal growth and development of the people. Scientific studies have shown that the food people eat, especially during the periods of rapid growth in early childhood, has a lasting effect on the stature of the entire race. Nutrition specialists state that a normal growing child to be properly nourished should consume approximately a quart of milk daily during the years of rapid growth, and that an adult should consume at least a pint of milk daily, or the equivalent in butter, cheese, and ice cream. Improving the quality of the milk supply, therefore, not only improves the financial condition of milk producers but also contributes to the health of the people.

OBJECT OF THE PROGRAM

The milk-quality improvement program outlined in this publication is designed to acquaint members of 4-H dairy clubs and other junior clubs with the importance of quality in milk, both from the economic standpoint of the producer and from the health standpoint of the consumer, and to teach these young people the essentials in the production of high-quality milk.

The program has been arranged to cover a year's work in 12 meetings for special milk-quality improvement clubs. The arrangement of the subject matter is such, however, that it may be easily adapted for presentation in one or two meetings of any dairy club. For the latter purpose it is suggested that the following subjects be taken up in the order mentioned: (1) Treatment of utensils; (2) cooling and storing milk; (3) clean, healthy cows; and (4) small-top milk pails.

PROCEDURE

In designating a time for holding the meetings outlined in this program, the leaders should give due consideration to the fact that many of the meetings require a period of five hours or more in which to complete the work assigned. In the school months it will often be possible to start the regular meeting with a preliminary session in the morning before school opens. This will afford the members an opportunity to make the various tests of milk samples as outlined in the project and to observe the results throughout the day. The results of the tests and other information can then be discussed in a final session after school hours.

It is desirable that as many club members as possible be given an active and definite part in each meeting. Assignment of work in making the various tests, recording results, and other duties to be performed, may be a means of carrying out this idea.

Throughout all meetings of the club, emphasis should be laid on the economic importance of producing only high-quality milk, and attention should be directed to the simple and inexpensive methods for producing such milk.

Where the community is governed by a milk ordinance, each subject should be presented in its relation to such ordinance, together with the reasons for having the ordinance.

The subject matter should be supplemented with charts, motion pictures, film strips, and publications. A list of such supplemental material available from the United States Department of Agriculture and instructions for obtaining it, are given on page 19 of this publication.

The following equipment will be needed for properly conducting this project: (1) Methylene blue tester, one outfit; (2) sediment tester, one outfit; (3) thermometers, one for each club member and one for the leader; and (4) pint sample jars, two for each club member.

If it is desired to conduct the acidity test, an outfit for the purpose will be necessary. For detailed information on the equipment required and where it can be purchased, consult the county agent or State dairy specialist.

MEETINGS AND SUBJECTS DISCUSSED

FIRST MEETING: ORGANIZATION OF THE CLUB

The first meeting is to be devoted largely to the organization of the club and to an explanation by the leader or county agent of the importance of milk-quality improvement work. The order of business for the first meeting is suggested as follows:

Meeting called to order by the county agent or local club leader.

Appointment of a temporary chairman from among the club members present.

Roll call.

Election of officers.

Appointment of an advisory committee. It is well to place the county agent or local leader, or both, on this committee.

The club leader will then explain the objects of the club, the various phases of the program, and describe the records to be kept by each club member. Blank record sheets for the year's work are provided in this publication on page 20.

Discussion of the advisability of having a demonstration team. If it is decided to develop a demonstration team it should be composed of those members who show the most interest in the work in the course of the year and the greatest aptitude in making the various tests, and in scoring and judging milk.

Outline of the program for the next meeting by the leader.

SECOND MEETING: BACTERIA IN MILK

The second meeting is to be devoted to a discussion of bacteria found in milk, types of bacteria, and methods of keeping bacteria out of milk. (See notes for leader's discussion of bacteria in milk, given below.)

After the discussion the leader will give each club member two 1-pint jars in which to bring samples of milk for study at the next meeting, the subject of which will be tests to determine the quality of milk. Two samples will be required, one from the milk produced on the farm the morning of the meeting, and the other from milk produced the night before.

The members should take all precautions to keep the containers and samples of milk free from contamination. Before using the jars treat them as follows: Thoroughly clean and rinse the jars and

covers; boil them in clean water for two or three minutes, and allow to cool. When the jars are sufficiently cool to handle, take them out of the water and screw the covers on tightly and keep them on until ready for use.

Keep the samples of milk cold, or on ice if possible.

NOTES FOR LEADER'S DISCUSSION OF BACTERIA IN MILK

In the production of quality milk bacteria play a major part. In order fully to understand the importance of bacteria in milk production some knowledge of bacteria and of their action on milk is necessary.

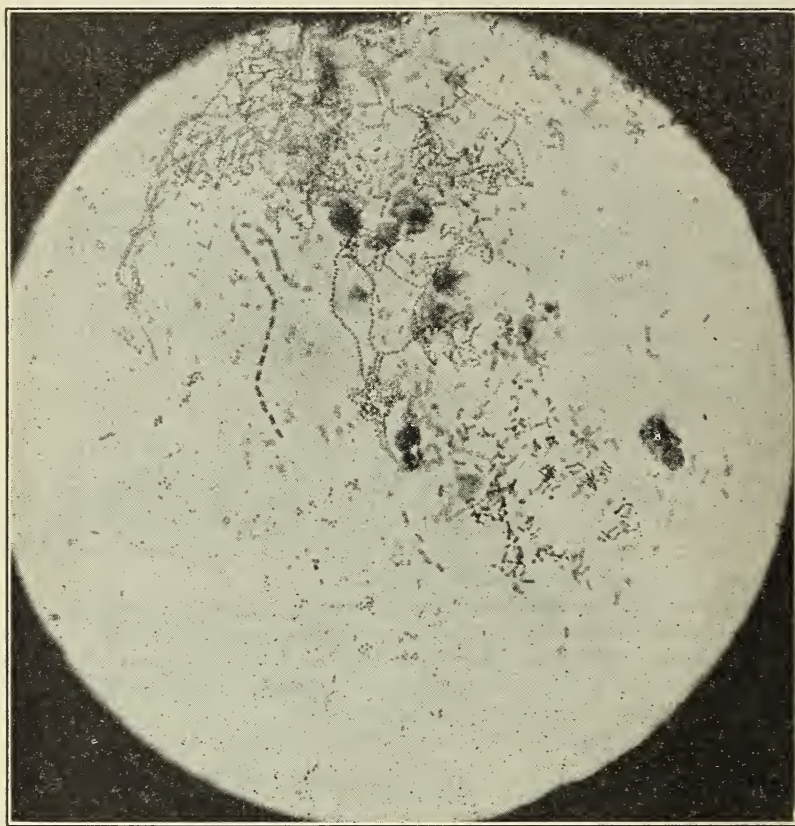


FIGURE 1.—Poor quality milk as seen through the microscope

Bacteria are single-celled plants which are so small they can not be seen with the naked eye.

All milk, unless produced under very exceptional conditions, contains some bacteria.

Milk furnishes ideal conditions and food material for bacterial growth. Some bacteria at maturity divide to form two bacteria, and under favorable conditions the two new individuals may become full-grown and repeat the process of division in from 20 to 30 minutes. The bacteria commonly found in milk multiply most rapidly at temperatures between 80° and 100° F. At 70° the rate at which the bacteria multiply is slower. At 50° the rate is still slower. At 40° and below the rate is very slow. However, a few kinds of bacteria continue to grow even at the freezing point.

Many of the kinds of bacteria ordinarily found in milk cause no apparent change in the milk. Other kinds may change the flavor without changing the appearance. Some of the most common types of bacteria cause marked changes in the milk, both in its appearance and flavor. In this class are the bacteria which sour milk by converting the milk sugar into lactic acid and those which cause the formation of a sweet curd. Another type of bacteria decomposes the casein and albumin in the milk and causes putrefaction and undesirable odors.

The number of bacteria in milk depends on the number of bacteria in the udder of the cow, on the number which get into the milk from outside sources, and on the rapidity or the rate at which the bacteria increase in numbers.

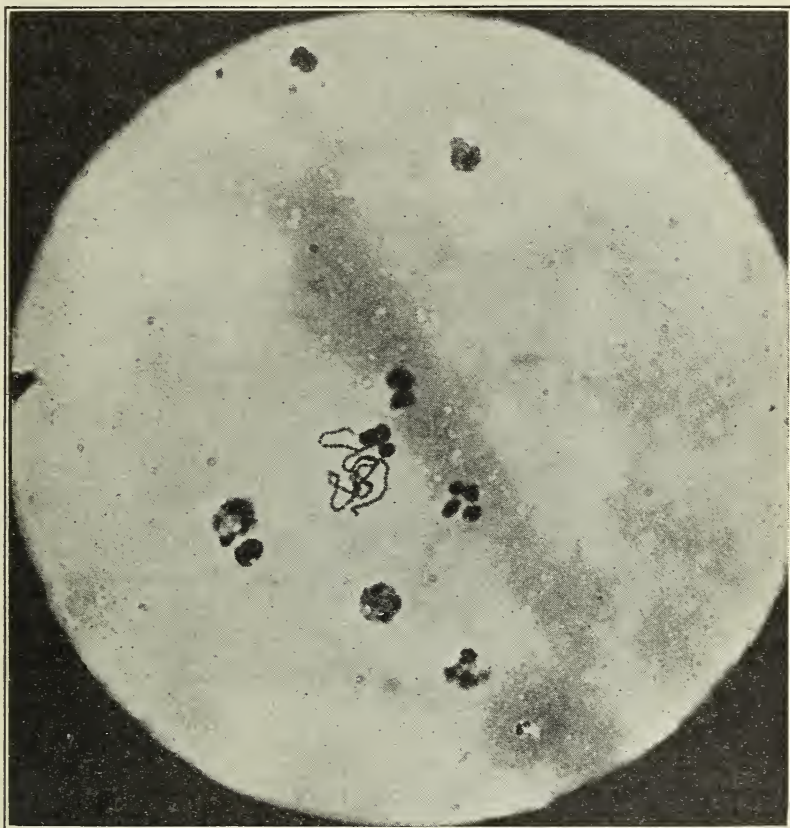


FIGURE 2.—Milk from an udder infected with a clinical case of mastitis (garget) as seen through a microscope

When examined with a microscope, milk may show varied forms of bacteria, depending on its quality. Poor-quality milk shows large numbers of bacteria, frequently of many types. (Fig. 1.) These may be special organisms known as cocci, or rod-shaped organisms, known as bacilli. These types may occur in many combinations. For example, the cocci may occur in pairs, in irregular masses, or in chains. If the milk is of high quality, few bacteria will be seen. But if the milk is from an udder infected with mastitis (garget), it will show long chains of streptococci and many leucocytes. (Fig. 2.) The leucocytes are white blood corpuscles, which are thrown off from the blood to battle the infection in the udder. In some samples only large numbers of leucocytes are seen, whereas, in other samples long chains of streptococci will be found accompanied by few leucocytes. (Figs. 1 and 2.)

It is very important to bear in mind that the rate at which these bacteria grow and increase in number depends very largely upon the temperature at which the milk is kept.

THIRD MEETING: TESTS TO DETERMINE THE QUALITY OF MILK

After the meeting has been opened, the club leader will describe the principles of the methylene blue test for milk and demonstrate the steps to be followed in making the test.

Following this demonstration, each member is to apply the methylene blue test to each of the two samples of milk he has brought to the meeting.

While the samples are in the water bath, the leader will describe and demonstrate the sediment test.

Each member will then apply the sediment test to each of the two samples.

The sediment disks will then be rated according to the scores shown in Figure 5.

The leader will give a short talk on tests for flavors and odors in milk (see tests for flavor and odor, p. 8) which is to be the main subject for discussion at the next meeting.

Each member and the leader will then judge the samples of milk for flavors and odors, the leader's opinion to be taken as the standard.

After these three tests for quality have been completed each member should record the results of the tests of his own samples in the proper place on the record sheet on page 20.

For the next, or fourth, meeting each member should read Leaflet 25, Preventing Feed Flavors and Odors in Milk, and prepare samples as follows: Feed one cow in the home herd silage, turnips, or other highly flavored feed one hour before the evening milking on the day preceding the fourth meeting. A pint sample of this milk is to be saved for the meeting. A pint sample of milk taken from the same cow the next morning should also be saved. The cow should not be fed the highly flavored feed before the morning milking.

NOTES FOR LEADER'S DISCUSSION OF TESTS TO DETERMINE THE QUALITY OF MILK

THE METHYLENE BLUE TEST

The methylene blue test is a simple method for determining the approximate number of bacteria in the milk and its keeping quality. (Fig. 3.) It is also known as the reduction test. The bacteria in the milk use up the oxygen and liberate substances which reduce or destroy the blue color in the milk, produced by adding methylene blue dye, and the milk turns white. The greater the number of bacteria present in the milk, the faster the oxygen is used up and the more rapidly the reducing substances are released. The greater the amount of reducing substances present, the less the time required for the milk to turn from blue to white. Therefore, the time required for the milk to turn from blue to white is a measure of the number of bacteria present.

The methylene blue solution should be of a strength of 1 part dye to 20,000 parts water. This is easily obtained by purchasing the methylene blue in tablet form, and then dissolving one tablet in distilled water or water which has been boiled and cooled, using the amount of water recommended by the manufacturer of the tablets.

Measure 10 cubic centimeters of milk into a clean test tube. Add 1 cubic centimeter of the prepared methylene blue solution to the 10 cubic centimeters of milk in the test tube. Place the stopper in the mouth of the test tube and invert the tube. In this way the dye is mixed with the milk.

Place the test tube containing the mixture in a water bath maintained at a temperature of approximately 37° C., or 100° F. Note the time that the sample is placed in the water bath.

At the end of 20 minutes note the color change, if any, and again every hour thereafter until the sample has turned white. High-quality milk should not decolorize in less than eight hours. Record the time required for the entire

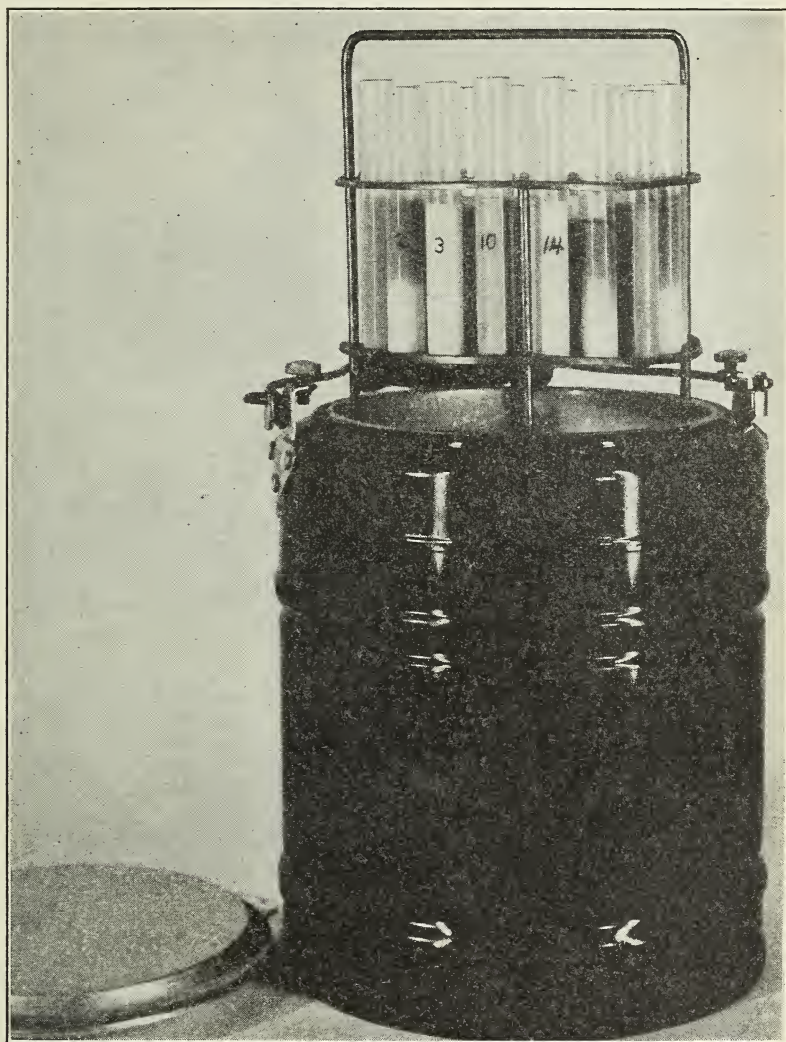


FIGURE 3.—Outfit for conducting the methylene blue test

sample to turn white. The length of time required for the color change to take place indicates the approximate number of bacteria present in the milk. Compute the number of bacteria as follows:

Time required for sample to turn white	Bacteria per cubic centimeter
20 minutes or less	Over 20,000,000.
20 minutes to 2 hours	4,000,000 to 20,000,000.
2 to 5½ hours	500,000 to 4,000,000.
5½ to 8 hours	100,000 to 500,000.
Over 8 hours	Less than 100,000.

THE SEDIMENT TEST

The sediment test is a simple means of determining the amount of sediment in milk. It will not show the amount of dirt that has been dissolved in the milk, nor will it show the amount that has been strained out. The presence of sediment in the milk, however, is an indication that unclean methods of production have been used. The importance of keeping dirt out of milk should be emphasized.

To determine the amount of sediment in milk, the milk should be slightly warmed and then mixed thoroughly by pouring from one vessel to another three or four times immediately before testing. A 1-pint sample is then forced through a sediment tester (fig. 4) in which a regulation cotton disk has been inserted. After the milk has been forced through the tester, the cotton disk is removed, and the relative amount of sediment on the disk is determined by comparing it with tests of other samples of milk that have been handled in different ways, or it may be compared and scored by using the photographs shown in Figure 5.



FIGURE 4.—Sediment testers

A perfectly clean cotton disk is given a score of 10. Figure 5 shows a method of grouping with numerical rating. Although the numbers in the figure show a half-point difference only, the analyst can make ratings between these numbers. For example, a cotton disk showing less dirt than 8 but more than 8.5 can be given a rating between 8 and 8.5. Care must be taken to rinse out the tester after each sample has been run through it.

TESTS FOR FLAVOR AND ODOR

Testing milk for flavor is a matter of individual judgment. The ability to judge milk for flavor can be acquired only through practice, and throughout this work all members should be given an opportunity to judge the flavor and odor of all samples brought in.

Before judging the milk for flavor, it should be warmed to a temperature between 85° and 95° F. The judging must be done in a room free from odors. The samples of milk should be well mixed before the cover of the container is removed, then some of the sample should be poured into a clean cup or beaker. Any odor present can be detected by placing the nose over the mouth of the container. The flavor can be judged by taking a little of the sample into the mouth. It is not advisable to swallow the liquid if many samples are to be judged, since it tends to reduce the sensitiveness of taste. Effort should be made to identify any abnormal or off flavors found in the milk.

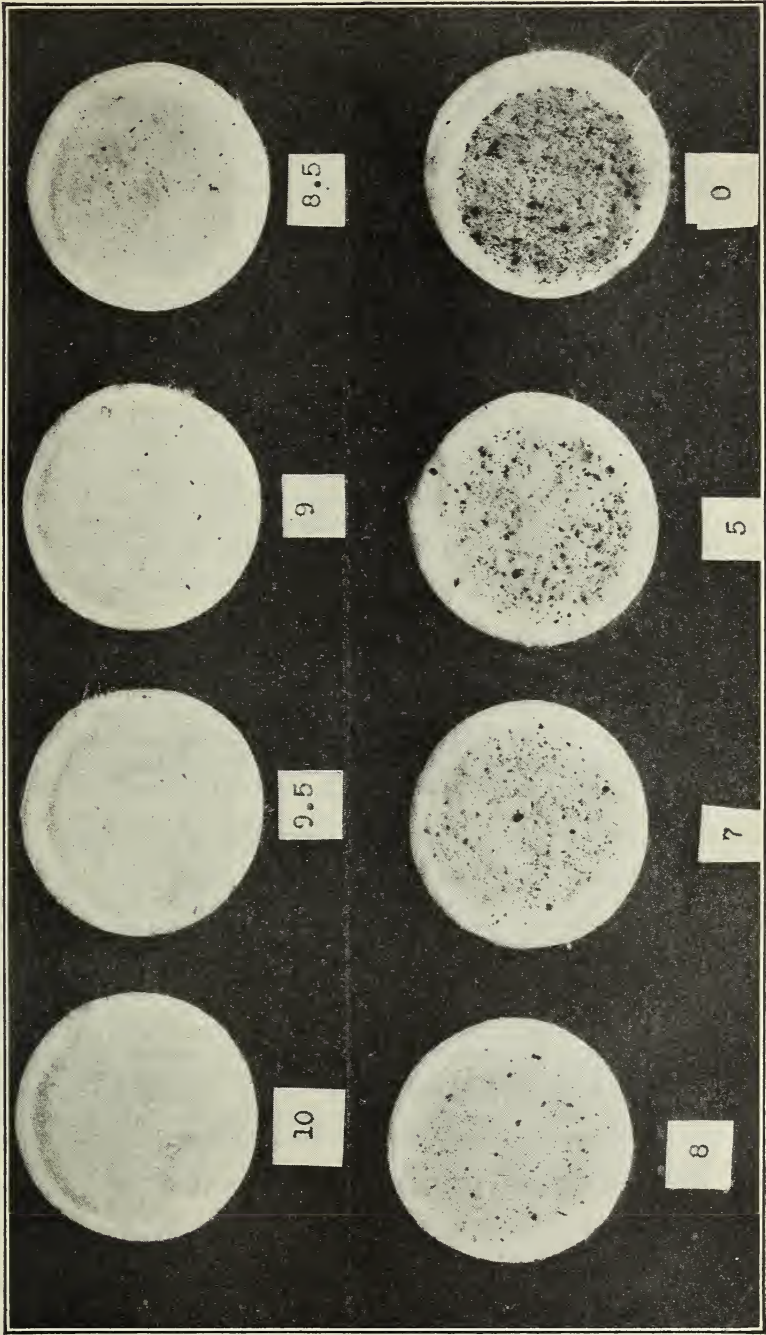


FIGURE 5.—Standard disks for sediment determination. (Actual size.) Numbers indicate the score

TABLE 1.—*General guide for scoring flavor and odor*

Flavor	Score	Description
Excellent.....	23 and above....	Supreme quality.
Good.....	21 to 23.....	Lacking special high flavor, flat, very slight feed, slightly cooked.
Fair.....	18 to 21.....	Cooked, feed, salty, slightly "cowy," slightly metallic.
Poor.....	12 to 18.....	Strong feed, weedy, bitter, strong, musty, "cowy," metallic, slightly rancid (cappy or cardboard).
Bad.....	12 to 0.....	Rancid, strong "cowy," high acid.
	0.....	Sour, putrid, or any flavor sufficiently strong to render the milk unfit for market-milk purposes.

FOURTH MEETING: FLAVORS AND ODORS

Immediately after the meeting has been opened, each member is to apply the methylene blue test and the sediment test to the two samples he has prepared according to instructions given at the preceding meeting.

Following these tests, the club leader will discuss the causes and prevention of feed flavors in milk and their economic importance. (See notes for leader's discussion of flavors and odors in milk, below.)

Each sample is then to be judged for flavor and odor. The club members should give special attention to those samples showing feed flavors, in order to familiarize themselves with the effects of feeds on the flavor of milk. Record the results of these tests on the record sheet on page 20.

For the next, or fifth, meeting the subject will be cooling and storing milk. Each member should study Farmers' Bulletin 976, *Cooling Milk and Cream on the Farm*, before the meeting. Samples for this meeting will consist of 1 quart of milk from the evening milking of the day before the meeting, divided into two 1-pint samples. One of the pint samples is to be kept at room temperature until the meeting, and the other is to be kept cold, preferably iced.

NOTES FOR LEADER'S DISCUSSION OF FLAVORS AND ODORS IN MILK

In the production of quality milk, flavor is as important as the bacterial count. To-day milk dealers reject milk that contains abnormal flavors as well as milk that is sour. In fact, of all the milk rejected as unfit for market purposes, the percentage rejected because it contains abnormal flavors is larger than the percentage rejected because it is sour.

Abnormal flavors in milk are most frequently caused by the cows consuming strong flavored feeds or weeds, these flavors being imparted to the milk through the body of the cow. Such flavors, however, are usually imparted to milk only during a few hours after the feeds or weeds have been consumed by the cow. They can, therefore, be prevented by feeding all highly flavored feeds immediately after milking, never just before milking. If the cows are on pastures infested with weeds which impart their flavor to milk, the cows should be removed from the pasture four to seven hours before milking.

FIFTH MEETING: COOLING AND STORING MILK

After the meeting has been called to order, the members will apply the methylene blue test and the sediment test to each of their samples. After making these tests, they will judge each sample for flavor and odor.

Special attention should be given to the judging of flavors at this meeting, as some of the uncooled samples may show a high acid flavor, indicating the development of bacteria of the lactic acid type.

The records of the methylene blue tests on the various samples should be charted to show the effect of cooling versus noncooling.

The subject for this meeting is cooling and storing milk, and the discussion on this subject will be led by the local leader. (See following notes for leader's discussion of this subject.)

The next, or sixth, meeting will be on the subject, cleaning dairy utensils. Each member should study carefully Farmers' Bulletin 1675, Care of Milk Utensils on the Farm. Samples for this meeting will consist of two 1-pint jars of milk. One sample should be of milk which has been milked into and kept in an unclean milk pail. The pail used should have been rinsed but not washed. The other sample should be from a pail that has been properly washed. Both samples should be from the evening milking preceding the day of the meeting and should be kept cold until they are brought to the meeting.

NOTES FOR LEADER'S DISCUSSION OF COOLING AND STORING MILK

A large number of the bacteria found in milk when it reaches the consumer are the result of improper cooling and of keeping the milk at too high a temperature during storage, transportation, and delivery. Milk must be cooled promptly after milking to 50° F. or below, if rapid bacterial growth is to be prevented. An accurate thermometer should be used to determine the temperature to which the milk is cooled. After cooling, the milk should be stored in ice water or kept cold in some other way until delivered.

SIXTH MEETING: CLEANING DAIRY UTENSILS

At the start of this meeting the club members will apply the methylene blue test and the sediment test to the samples of milk they have brought in. They will also judge the samples for flavors and odors and record the scores.

The leader will discuss the proper methods of washing and cleaning dairy utensils and explain the necessity for the various steps in the cleaning process. (See notes for leader's discussion, below.)

The next, or seventh, meeting is to be on another phase of this same subject, namely, treatment of dairy utensils to kill bacteria, which is extremely important. The club members should again study Farmers' Bulletin 1675.

The members of the club will be divided into two groups, and each group will bring samples of milk for the next meeting, as follows: Members of group 1 will each bring two 1-pint samples of milk. One sample of milk should be from utensils which have been thoroughly washed but not treated to kill bacteria. The other sample should be taken from utensils which after thorough washing have been treated by steam as described on page 3 of Farmers' Bulletin 1675. Members of group 2 will bring two 1-pint samples of milk, one taken from utensils which have not been treated and the other from utensils which have been properly treated with chemicals as described on page 7 of Farmers' Bulletin 1675.

NOTES FOR LEADER'S DISCUSSION ON CLEANING DAIRY UTENSILS

Dairy utensils, such as milk pails, milking-machine parts, milk cans, strainers, coolers, etc., which have not been properly cared for are undoubtedly the source of most bacteria found in milk before bacterial growth has started. When dirt and particles of milk are left on dairy utensils, bacteria grow and multiply in this dirt and contaminate the milk as soon as it comes into contact

with it. The bacteria which thrive in dirty utensils are usually putrefactive bacteria, which cause the milk to have a foul odor and taste.

In washing dairy utensils, always remove with cold or lukewarm water as much as possible of the foreign material, milk, and cream adhering to their surfaces. Otherwise the wash water soon becomes dirty, highly contaminated with bacteria, and unfit for use. After the utensils have been rinsed, remove all remaining foreign matter by scrubbing with a brush, hot water, and an alkali or soda-ash washing powder; never use rags, greasy soaps, or soap powders. After scrubbing, the utensils should again be rinsed in clean, pure water.

SEVENTH MEETING: TREATING DAIRY UTENSILS TO KILL BACTERIA

After the meeting has been opened, the club members will apply the methylene blue test and the sediment test to each of the samples of milk that they have brought in. After these two tests have been applied, the samples will be judged for flavors and odors, and the results recorded.

The leader will then lead the discussion on various methods used in chemical and steam treatment of dairy utensils and the reasons therefor. (See notes for leader's discussion, below.)

The subject of the next, or eighth, meeting is to be clean, healthy cows and milkers, and dry-hand milking. The club members should prepare for the meeting by studying Farmers' Bulletin 602, Production of Clean Milk.

The leader will divide the members into two groups and instruct each group to prepare samples of milk for the eighth meeting, as follows: Members of group 1 will each prepare two 1-pint samples of milk. One sample should be of milk drawn from a cow without making any effort to clean the udder, teats, and flanks previous to milking. The other sample should be of milk drawn from the same cow after carefully cleaning the udder, teats, and flanks. Members of group 2 will each prepare two 1-pint samples; the first sample will be of milk drawn by the dry-hand method, the second sample by the wet-hand method. Samples for both groups should be from the evening milking previous to the day of the meeting.

NOTES FOR LEADER'S DISCUSSION ON TREATING DAIRY UTENSILS TO KILL BACTERIA

Dairy utensils which have been properly washed and which appear clean to the eye may still contain large numbers of bacteria. To prevent contamination of milk it is, therefore, necessary that the utensils be treated to kill as many bacteria as possible. Treating dairy utensils to kill bacteria is not a substitute for thorough washing, however, but an additional preventive measure. The utensils must be free of all foreign matter before being treated, if the treatment is to be effective.

Two methods of treating dairy utensils to kill bacteria are in common use. The application of heat in the form of steam is the method that has been in general use for the greatest length of time. The most effective way of using steam is to place the utensils in a tight cabinet and turn steam into the cabinet for a long enough time to accomplish the results desired. If the steam is evenly distributed in the cabinet, and a reliable thermometer in the top of the cabinet shows that a temperature of 200° F. or higher has been maintained for five minutes or longer, it may be concluded that the bacteria on the utensils have been killed. The utensils should be placed in the cabinet in an inverted position in order that the condensed steam will drain from them. Where steam is not available, the utensils may be placed in water and boiled for five minutes.

The second method of treating dairy utensils to kill bacteria is by using a chlorine solution. The chlorine solution may be prepared as follows:

Prepare a stock solution by first making a smooth paste of 12 ounces of commercial chloride of lime containing 30 per cent available chlorine (or 15 ounces of chloride of lime containing 24 per cent available chlorine) and then adding water slowly and stirring thoroughly until 2 gallons of the solution is obtained. Let this stock solution settle, then strain into a tightly closed bottle or jar, and keep in a cool, dark room. When ready to treat the utensils add 1 pint of the stock solution to every 8 gallons of water and use immediately for the final rinse. The used rinse solution should be thrown away and a fresh rinse solution made up just before treating the utensils again. It is advisable not to make larger quantities of stock solution than can be used within two weeks' time.

In using the chlorine solution, the utensils should be completely immersed and left for at least two minutes.

After the utensils are treated to kill bacteria, they should be protected from contamination. If the utensils are treated in a steaming cabinet, they should be left in the cabinet until needed. If they are treated in chlorine solution, the utensils after removal from the chlorine solution should be inverted in a clean, dry place free from odors and all sources of contamination.

EIGHTH MEETING: CLEAN, HEALTHY COWS AND MILKERS, AND DRY-HAND MILKING

At the start of the meeting, the members will apply the methylene blue test and the sediment test to the samples of milk they have brought in. They will then judge and score each sample on flavor and odor. The local leader will then lead a discussion of the three phases of the subject for this meeting. (See notes for leader's discussion, below.)

The subject of the next, or ninth, meeting will be small-top pails and open-top pails. Reference to this subject will be found in Farmers' Bulletin 602, page 8, and should be studied by the members before the meeting.

The milk samples for the ninth meeting will consist of two 1-pint samples. In order to show in an exaggerated form the value of the small-top pail as compared to the open-top pail, the two samples should be from the same cow, and from one that has not been cleaned before milking. For one sample draw the milk into an open-top pail, and for the other sample draw it into a small-top pail. The samples are to be prepared from the milking of the evening preceding the meeting.

NOTES FOR LEADER'S DISCUSSION OF CLEAN, HEALTHY COWS AND MILKERS, AND DRY-HAND MILKING

One of the first requirements in the production of high-quality milk is to have healthy cows. Cows should be tested at least once each year for tuberculosis. If reactors are found, they should be removed from the herd immediately and the stables disinfected. When reactors are found in the herd, the test should be repeated in six months. Only animals that have been tested and found free of the disease should be added to the herd.

If cows have aborted from any cause, the herd should be tested for contagious abortion. Reactors should be removed from the herd and the stables disinfected. Only animals that have been tested and found free of the disease should be added to the herd.

At least once each week, the first stream of milk from each teat should be milked on a fine sieve, black cloth, or glass, in order to detect garget or other abnormalities that may be present in the udder. Milk that appears watery, lumpy, stringy, bloody, or contains flecks or specks, is abnormal. Discard all abnormal milk and all milk from abnormal udders. The affected cows should be removed from the milking herd.

The body of the cow, especially those parts immediately above the milk pail, may be the source of bacterial contamination, because foreign matter may fall into the milk pail. Have the cows clean at milking time. Provide plenty of clean, absorbent material for bedding each day and remove all soiled bedding. The cows should be groomed with brush and currycomb at least once, and preferably twice a day. The grooming should be done at least one hour before milking time. Clip the long hairs from the udders, flanks, and tails in order that dirt may not cling to them. Before milking, carefully wipe the udders, flanks, and bellies with a clean, damp cloth to remove dust and loose hairs. If these parts are very dirty, wash them. Plenty of bedding, good stables, and frequent removal of manure will help keep the cows clean.

Milkers and milk handlers should realize at all times that they are handling a human food which is easily contaminated. They should wear clean outer clothing when milking and handling milk. The hands should be washed before starting to milk, and washed again whenever they become soiled during milking. Milk with clean, dry hands.

NINTH MEETING: SMALL-TOP AND OPEN-TOP PAILS

At the start of the meeting the club members will apply the methylene blue test and the sediment test to each sample of milk they have brought in. They will then judge each sample on flavor and odor, and record the results.

In discussing the subject of small-top and open-top pails, the leader can show the advantage of the small-top pail by allowing sand or powdered chalk to fall into or onto both pails while in milking position. This will graphically illustrate the difference in the amount of dirt which falls into both types of pail.

The subject for the next, or tenth, meeting is general sanitation, and the score card. In preparation for this meeting each member should study Department Circular 276, Inspection of Milk Supplies. Also, each member should obtain a copy of the local milk ordinance, if there is one, and study the requirements for sanitation in the production of milk and cream for sale. Study also the dairy farm score card of the Federal Bureau of Dairy Industry, reproduced on pages 16 and 17, and, if possible, get copies of the score card of the local health department and note the relative importance of each item of sanitation.

Samples of milk for the tenth meeting will consist of two 1-pint samples, one of which represents the milk taken from the regular herd on the home farm the evening before the meeting. The other sample should be from regular herd milking on the morning of the meeting.

NOTES FOR LEADER'S DISCUSSION ON SMALL-TOP AND OPEN-TOP PAILS

Most of the dirt that gets into milk falls from the cow into the pail at milking time. There are fewer bacteria in the milk and there is less sediment when the small-top pail is used than when an open-top pail is used.

TENTH MEETING: GENERAL SANITATION AND SCORE CARDS

The club members will apply the methylene blue test and the sediment test to the samples of milk they have prepared for this meeting. They will also judge and score each sample on flavor and odor.

The results of the tests at this meeting should then be compared with the results of the tests in the third meeting to determine

whether there has been any improvement in the regular herd milk on the home farms of the members.

The club leader will discuss the subject of general sanitation on the dairy farm and describe the score card and its application to quality milk production. There should also be a discussion of the local milk ordinance. Each club member should study the notes for the leader's discussion, below.

At the next, or eleventh, meeting there is to be a contest to determine how well the members have learned to apply the principles of producing high-quality milk. For this contest each member will submit two samples of milk which have been produced and cared for in the best way possible, or according to the principles taught in the course of the year's club work.

NOTES FOR LEADER'S DISCUSSION ON GENERAL SANITATION AND SCORE CARDS

Instructions for maintaining general sanitation on dairy farms are suggested as follows:

Arrange for periodical medical examination of each person on the farm to determine whether any person may be a carrier of typhoid, tuberculosis, or other infectious disease. Allow no person who has a contagious or infectious disease or who has sore throat to come in contact with the milk or milk utensils.

Have water supply tested yearly or oftener for possible presence of harmful bacteria. Do not use water from a contaminated source of supply. Have all wells or cisterns tightly covered and curbed to prevent entrance of surface drainage, dust, or dirt.

See that the privy meets the recommendations of the State board of health and is located away from the water supply and dairy buildings.

Remove accumulations of manure daily and spread the manure on the fields or place it in a tightly closed or screened manure pit equipped with a fly trap. Use effective means of fly control.

Allow 4 square feet of window space per stall, with the window space evenly distributed in the barn.

Allow 500 cubic feet of air space per stall. Control ventilation either by an adjustable flue system or by windows hinged at the bottom. Avoid direct drafts or strong air currents.

Have a tight stable floor, smooth and impervious to moisture. Have a concrete manure gutter 16 inches wide and 8 inches deep, mangers which are simply constructed of impervious material and are easily cleaned, swinging stanchions, and iron stall rails.

Remove manure from the barn twice daily at least one hour before milking time. Feed dusty feeds after milking or long enough before milking to allow dust to settle out of the air. Keep barn cleared of dust and cobwebs. Have walls and ceiling painted or whitewashed at least annually.

See that drainage from all yards is led away from barns and water supply, and that yards are free from mud holes. Remove droppings at least once a week.

The milk house should be tightly screened. It should have a window space equal to 10 per cent of the floor space and an outlet flue in the roof. Floors should be tight, smooth, impervious to moisture, and should be sloped to a bell-trap drain connected to a drainpipe leading well away from the milk house. Walls and ceilings should be free from dust and cobwebs. Floors should be kept clean, and nothing should be stored in the milk house except dairy utensils and supplies.

Coolers, cans, and other milk utensils should be of smooth, durable material that does not affect milk. They should be free from rust and dents. Cans should have tightly fitting covers which provide no place for water or dirt to accumulate.

To determine the sanitary conditions of dairy farms, a score card is frequently used as a basis for giving credits for good conditions and for cutting or marking down the bad conditions. A reproduction of the score card used by the Bureau of Dairy Industry in its inspection of dairy farms appears on pages 16 and 17. Note that a perfect dairy farm, from the standpoint of sanitation

would receive a score of 100 points, or 40 points for perfect sanitary equipment and 60 points for sanitary perfection in the methods used. This arrangement of points is made for the purpose of emphasizing the importance of good methods and of proper equipment in producing a clean product.

[FRONT OF SCORE CARD]

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF DAIRY INDUSTRY

SANITARY INSPECTION OF DAIRY FARMS

SCORE CARD

Owner or lessee of farm-----

P. O. address----- State-----

Total number of cows----- Number milking-----

Gallons of milk produced daily-----

Product is sold by producer to families, hotels, restaurants, stores, or
to----- dealer. (Check which.)

For milk supply of-----

Permit No.----- Date of inspection-----, 193

Remarks: -----

(Signed)-----

Inspector.

[BACK OF SCORE CARD]

Equipment	Score		Methods	Score	
	Per- fect	Al- lowed		Per- fect	Al- lowed
COWS			COWS		
Health.....	6	-----	Clean.....	8	-----
Apparently in good health.....	1	-----	(Free from visible dirt, 6.)		-----
If tested with tuberculin within		-----	STABLES		
a year and no tuberculosis is		-----	Cleanliness of stables.....	6	-----
found, or if tested within six		-----	Floor.....	2	-----
months and all reacting ani-	5	-----	Walls.....	1	-----
mals removed.....		-----	Ceilings and ledges.....	1	-----
(If tested within a year and react-		-----	Mangers and partitions.....	1	-----
ing animals are found and remov-		-----	Windows.....	1	-----
3.)		-----	Stable air at milking time.....	5	-----
Food (clean and wholesome).....	1	-----	Freedom from dust.....	3	-----
Water (clean and fresh).....	1	-----	Freedom from odors.....	2	-----
STABLES			Cleanliness of bedding.....	1	-----
Location of stable.....	2	-----	Barnyard.....	2	-----
Well drained.....	1	-----	Clean.....	1	-----
Free from contaminating sur-		-----	Well drained.....	1	-----
roundings.....	1	-----	Removal of manure daily to 50 feet		-----
Construction of stable.....	4	-----	from stable.....	2	-----
Tight, sound floor, and proper		-----	MILK ROOM OR MILK HOUSE		
gutter.....	2	-----	Cleanliness of milk room.....	3	-----
Smooth, tight walls and ceiling.....	1	-----	UTENSILS AND MILKING		
Proper stall, tie, and manger.....	1	-----	Care and cleanliness of utensils.....	8	-----
Provision for light: Four sq. ft. of		-----	Thoroughly washed.....	2	-----
glass per cow.....	4	-----	Treated with steam for 15 min-		-----
(Three sq. ft., 3; 2 sq. ft., 2; 1 sq.		-----	utes.....	3	-----
ft., 1. Deduct for uneven distribu-		-----	(Placed over steam jet, or scalded		-----
tion.)		-----	with boiling water, 2.)		-----
Bedding.....	1	-----	Protected from contamination... 3		-----
Ventilation.....	7	-----	Cleanliness of milking.....	9	-----
Provision for fresh air, control-		-----	Clean, dry hands.....	3	-----
lable flue system.....	3	-----	Udders washed and wiped.....	6	-----
(Windows hinged at bottom, 1.5;		-----	(Udders cleaned with moist cloth,		-----
sliding windows, 1; other open-		-----	4; cleaned with dry cloth or brush		-----
ings, 0.5.)		-----	at least 15 minutes before milking,		-----
Cubic feet of space per cow, 500		-----	1.)		-----
ft.....	3	-----	HANDLING THE MILK		
(Less than 500 ft., 2; less than		-----	Cleanliness of attendants in milk		-----
400 ft., 1; less than 300 ft., 0.)		-----	room.....	2	-----
Provision for controlling tem-		-----	Milk removed immediately from		-----
perature.....	1	-----	stable without pouring from pail... 2		-----
UTENSILS			Cooled immediately after milking		-----
Construction and condition of uten-		-----	each cow.....	2	-----
sils.....	1	-----	Cooled below 50° F.....	5	-----
Water for cleaning.....	1	-----	(51° to 55°, 4; 56° to 60°, 2.)		-----
(Clean, convenient, and abundant.)		-----	Stored below 50° F.....	3	-----
Small-top milking pail.....	5	-----	(51° to 55°, 2; 56° to 60°, 1.)		-----
Milk cooler.....	1	-----	Transportation below 50° F.....	2	-----
Clean milking suits.....	1	-----	(51° to 55°, 1.5; 56° to 60°, 1.)		-----
MILK ROOM OR MILK HOUSE			(If delivered twice a day, allow		-----
Location: Free from contaminating		-----	perfect score for storage and trans-		-----
surroundings.....	1	-----	portation.)		-----
Construction of milk room.....	2	-----			-----
Floor, walls, and ceilings.....	1	-----			-----
Light, ventilation, screens.....	1	-----			-----
Separate rooms for washing utensils		-----			-----
and handling milk.....	1	-----			-----
Facilities for steam.....	1	-----			-----
(Hot water, 0.5.)		-----			-----
Total.....	40	-----	Total.....	60	-----

Equipment..... + Methods..... = ...Final Score

NOTE 1.—If any exceptionally filthy condition is found, particularly dirty utensils, the total score may be further limited.

NOTE 2.—If the water is exposed to dangerous contamination, or there is evidence of the presence of a dangerous disease in animals or attendants, the score shall be 0.

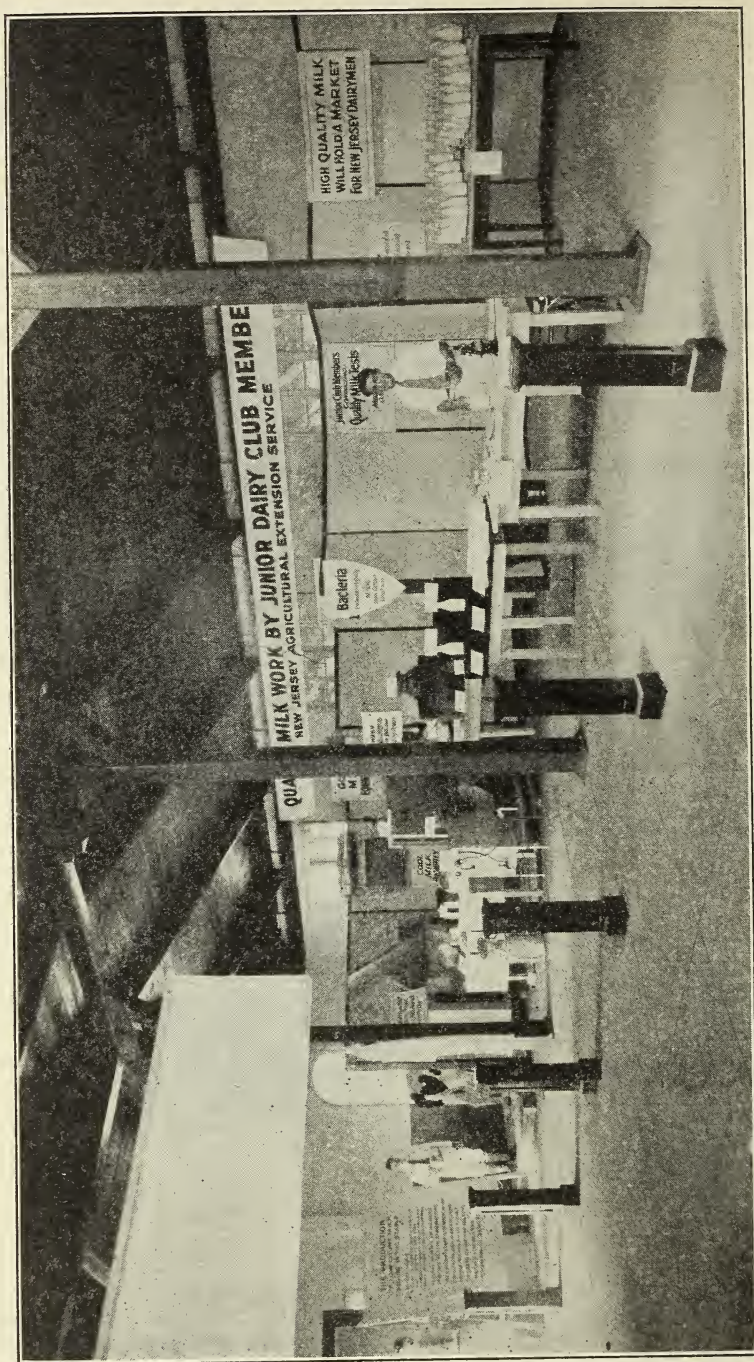


FIGURE 6.—A team from a 4-H milk-quality improvement club demonstrating in connection with milk-quality exhibit at a State fair

ELEVENTH MEETING: MILK CONTEST

The club members will apply the methylene blue test and the sediment test to the samples of milk prepared for this contest and also score them as to flavor and odor.

If possible, it is desirable to have the State dairy specialist present at this meeting to summarize and to discuss the results of the contest.

A general résumé of the year's work should be given, and plans should be made for the next year's work if the club is to continue.

The club members and the leader will discuss plans for the field day, which will constitute the last regular meeting of the year.

The demonstration team (fig. 6) should be chosen at this time, if one is to be organized, and an outline made for the work of the team.

TWELFTH MEETING: FIELD DAY

This is the final meeting of the club and should take the form of a field-day meet. The following events are suggested: (1) Exhibition by the demonstration team, if such a team has been organized. (2) Visit to a milk-receiving station to study the methods used. The operator of the station can assist in this part of the program. (3) Visit to a certified or model farm and a study of the methods used. (4) Picnic dinner—with adults present. (5) Award of prizes or grades for work done throughout the year. (6) Games.

If time is available, a visit to some of the members' farms would be desirable, especially to those which have shown improvement as a result of the club member's work.

An interesting possibility for further dissemination of the knowledge gained in the year of club work would be to arrange for the demonstration team to present the subject of quality-milk improvement at grange meetings or similar gatherings of adult dairymen.

REFERENCES

The publications of the United States Department of Agriculture referred to in this publication, and which should be studied by the club members, are listed below. Any of these publications may be obtained, as long as the supply for free distribution lasts, by writing to the United States Department of Agriculture, Washington, D. C.

- Farmers' Bulletin No. 602, Production of Clean Milk.
- Farmers' Bulletin No. 976, Cooling Milk and Cream on the Farm.
- Farmers' Bulletin No. 1214, Farm Dairy Houses.
- Farmers' Bulletin No. 1315, Cleaning Milking Machines.
- Farmers' Bulletin No. 1342, Dairy-barn Construction.
- Farmers' Bulletin No. 1675, Care of Milk Utensils on the Farm.
- Department Circular No. 276, Inspection of Milk Supplies.
- Leaflet No. 3, Improved Sanitation in Milk Production.
- Leaflet No. 25, Preventing Feed Flavors and Odors in Milk.
- Dairy Division, D. D. 624, Clean Milk is Easily Produced.

The following material may be purchased from the United States Department of Agriculture, or will be loaned for the cost of transportation:

- Film strip—Production of Clean Milk.
- Film strip—Tests for Determining the Bacterial Quality of Milk.
- Motion-picture film (1 reel)—Quality Milk.

RECORD OF TESTS ON CLUB MEMBERS' SAMPLES

Records for—	Samples tested	Methy- lene blue reduction time	Esti- mated bacterial count	Sediment score	Flavor and odor score	Remarks
Third meet- ing.	Herd milk: Evening milking.....	Hours	Number			
	Morning milking.....					
Fourth meet- ing.	Cow fed high-flavored feed; evening milking.					
	Cow fed no high-flavored feed; morning milking.					
Fifth meeting.	Herd milk: Cooled.....					
	Uncooled.....					
Sixth meeting.	Milk from uncleaned uten- sils.					
	Milk from cleaned uten- sils.					
Seventh meet- ing.	Group 1: Milk from untreated utensils.					
	Milk from steam- treated utensils.					
	Group 2: Milk from untreated utensils.					
	Milk from chemically treated utensils.					
Eighth meet- ing.	Group 1: Milk from cow not cleaned.					
	Milk from groomed cow.					
	Group 2: Milk from cow milked with clean, dry hands.....					
	Milk from cow milked with wet hands.....					
Ninth meet- ing.	Individual cow's milk: From open-top pail...					
	From small-top pail...					
Tenth meet- ing.	Herd milk: Evening milking.....					
	Morning milking.....					
Eleventh meeting.	Milk contest: Sample 1.....					
	Sample 2.....					

